ATTACHMENT A:

"Domestic Tankhouses of Rural California" by Leon S. Pitman (Pioneer America Vol. 8, No. 2 (July 1976), pp. 84-97)

Domestic Tankhouses of Rural California

By Leon S. Pitman

In the latter half of the nineteenth century, farmers in California and other parts of America acquired the practice of elevating water tanks on platforms about 15 to 20 feet above the ground. This practice followed closely behind the widespread adoption of the American self-regulating windmill and provided the farmer with an efficient pumped-gravity water pressure system for household and farm needs.

From the 1870s to the 1930s California farmers enclosed the tower and tank to form the more useful tankhouse (Figs. 1 and 2). The enclosed tower, or tankhouse, became a conspicuous element on nearly every farmstead, standing tall and narrow, usually by itself with a windmill attached to one side. The tankhouse is two or three stories tall with the tank on the top floor, and rooms below for storage, bedrooms, or whatever.

In California today the tankhouse is still conspicuously present as a relic on older farmsteads and forms a distinctive element in the rural landscape. It also serves as a reminder of an important phase in the development of rural domestic water supply systems, a phase now superseded by more modern domestic water supply technology. As farmlands yield to urban expansion, the tankhouses are rapidly disappearing. Most urban Californians are ignorant of the once important purpose of these old farm structures, and though tankhouses are still numerous, even rural people hardly notice them. While students and scholars of rural settlement have described and analyzed the occurrence of house types, fences, barns, and other outbuildings, they have ignored tankhouses in the literature. The tankhouse is a product of a preindustrial age and is a folk or vernacular architectural expression designed to meet practical and functional needs on the farm. I now wish to take notice of the domestic tankhouse and to make a statement regarding its architectural forms, regional occurrence, and historical development.

California Tankhouse Morphology

The California tankhouse is the walled enclosure of an elevated tank and tower, and it assumes a tall narrow shape easily distinguishable from all other buildings on the farmstead. Even when the tankhouse is attached to the house or when appendages are added, the tall lean shape still reveals its true identity. Nevertheless, California farmers have shown that by employing a variety of construction options and treatments, this basic shape may be exhibited in a variety of different types and styles. Certain of these varieties in form are directly related to the construction options of the tower and tankroom and are here designated as "tankhouse types." Other form elements are independent of the options in tower shape and occur interchangeably on any of the tankhouse types. These include height variations, roof types, building materials, and stylistic treatments rendered for aesthetic effects.

Tower Construction and Tankhouse Types

The tower which forms the skeletal framework for the tankhouse must be built solid and heavy enough to buttress the weight of a 2,000- to 10,000-gallon water tank. Typically the tower consists of four or eight heavy vertical 6" x 6" support posts, one on each corner and an optional one midway between each corner. Lighter vertical studding may be added in the spaces between

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FIGURE 1. Skeletal tower and elevated water tank on a farm near Hollister, San Benito County, California. Most California farmers considered an exposed tower such as this unsightly and preferred to enclose it to form the more useful tankhouse.

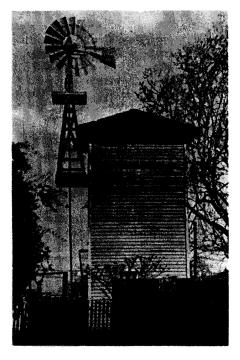
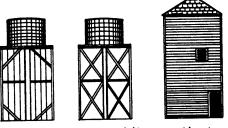
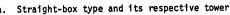


FIGURE 2. When a tank tower, platform and water tank are fully enclosed, the structure becomes a domestic tankhouse such as this one near Winton, Merced County. The two rooms below the tankroom and its platform may be used as miscellaneous storage space or for bedrooms. The enclosed tankroom prevents most windblown debris from entering the tank. Most tankhouses once contained a windmill attached to floor joists extending from the platform.

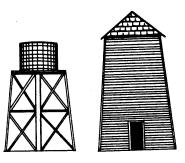
heavy posts or the eight posts may be bound together with cross-braces (Fig. 3a). The choice of braces or studding, though not important to the tankhouse type, may affect the positioning of doors and windows when the tower is finally walled and completed as a tankhouse. The platform on which the tank rests also must be of sturdy construction, consisting of a wood floor nailed to 2" x 12" joists, placed edge up and spaced about a foot apart across heavy horizontal members fastened along the top of the vertical tower posts (Fig. 1). The key determinant of the tankhouse type is the optional positioning of the vertical tower posts in relation to the edge of the platform.







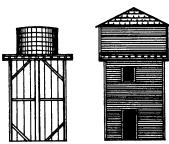
b. Inset-top type



c. The full tapered type and its respective tower

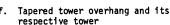


d. Tapered tower box type



 Straight-box overhang type and its respective tower





 $\label{figure} \mbox{Figure 3. Six California domestic tankhouse types as determined by tower and tankroom construction.}$

Six tankhouse types¹ are designated here (Fig. 3):

1. The straight box type (Fig. 3a) is achieved by placing the support posts exactly vertical and joining the platform flush at its edges and outer corners, and the whole, including the tank, enclosed to form straight vertical walls from ground to eaves (Fig. 4). The straight box type was most likely the simplest fully enclosed tankhouse to build. Besides its simplicity, another advantage was the ease by which a windmill tower could be attached to floor joists extended from the platform and directly over a well just outside the tankhouse. And with the tankroom walls the same dimensions as the platform, extra floor space in the tankroom could be used for repair work or movement about the tank.

The straight box type was the most popular and the most widespread in the state. Examples remain in all settled sections of the state from Modoc County in the northeast to San Diego County. The straight box overwhelmingly predominates in Sacramento and San Joaquin valleys (Fig. 5) where the bulk of California's tankhouses remain today.

- 2. The *inset top* type (Fig. 3b) contains the same tower construction as the straight box but differs in that the tankroom is built in dimensions smaller than that of the platform and tower below, producing the inset top effect. This is the rarest of all tankhouse types recognized here, with examples noted only in the Fresno area. Perhaps this type is rare because it restricts the amount of working space around the tank.
- 3. The full tapered type (Fig. 3c) is achieved by tapering both the support posts and tankroom studding in an unbroken angle from ground to eaves. The broadest dimensions are at ground level, the smallest at the eaves. The full tapered type is usually rendered with only two stories, though slightly tapered three-story examples can be found, particularly in the Sonoma and Napa valleys. As with the inset top type, the full tapered tank room walls restrict the working space around the tank.
- 4. The tapered tower box type (Fig. 3d) differs from the full tapered type in that only the tower tapers upward to the outer edges of the platform while the tankroom contains the straight vertical walls of the box type. Many of these full tapered and taper tower box tankhouses were built directly over a well or spring rather than to one side of the well (Fig. 6). Perhaps the larger dimensions at ground level discouraged the use of the popular side-attached windmill and outside well, for it required a greater extension of the windmill from the side of the platform than is true of the other tankhouse types. Early illustrations show that many tapered tower types contained windmills attached atop the roof with the well-rod extending down through the inside of the tankhouse. The top-attached windmills, however, were discontinued before the turn of the century and most extant examples of the tapered tower box are absent of windmills. This type is most common in the Sonoma and Napa valleys but rare in the Sacramento-San Joaquin Valley.
- 5. Straight-box overhang types (Fig. 3e) are achieved by positioning vertically straight tower supports one or two feet inward from the outer edges of the platform, producing a platform and tankroom with dimensions larger than the tower rooms below. This type is quite common in the rural San Francisco Bay area (Fig. 7). Its advantages are a spacious area for a large water tank plus space in the tankroom for repair work and the ease of constructing a windmill tower over an outside well.
- 6. The tapered-tower overhang type (Fig. 3f) is made by tapering the tower posts one or two feet inward from the edge of the platform, producing an overhanging tankroom larger than the tower rooms below (Fig. 8). Very large and tall tankhouses quite commonly are of this type. Tapered supports were recommended for buttressing heavy weights, and the large tankroom preserves all of the advantages of the straight-walled overhang. The tapered-tower overhang is the second most common tankhouse type in California, occurring in all parts of the state and predominating in areas north of the San Francisco Bay (Fig. 5). In the Sacramento and San Joaquin valleys, the tapered-tower overhang makes up about 15-20 per cent of all tankhouses.

The Walled Tower, Open Platform Option

Any of the tankhouse types designated above may have completely open platforms with an exposed tank, a roof over the tank perched on stilts extending up from each corner, or a stylistic partial walling (Fig. 9). Such tankhouses



FIGURE 4. Straight box tankhouse near Turlock, Stanislaus County, typifying the most common and widespread of all tankhouse types in California, and representing the type most prominent in the Sacramento and San Joaquin Valleys.

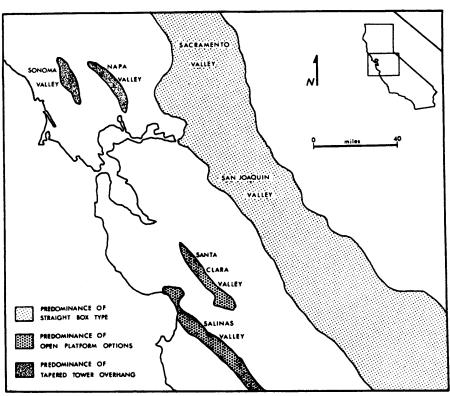


FIGURE 5. Tankhouse type regions in Central California, 1975.

predominate in valleys south of the San Francisco Bay and in the Salinas Valley (Fig. 5). In the Sacramento and San Joaquin valleys, however, very few tankhouses with open platforms remain. The chief advantages of the open or partially walled platform are its lower construction costs and the easier access to the tank for cleaning and repair, though tank-cleaning must have been necessary more frequently when exposed on an open platform.

Regional differences in tankhouse type may be accounted for largely by the tendency of farmers within a region to copy one another. Direct borrowing from neighbors is a most effective idea-diffusion process. Areal differences in the predominance of types are more pronounced when districts are separated by some physical barrier such as mountains. Within the Sacramento-San Joaquin Valley, there is greater similarity in tankhouse types than there is between any part of this large valley and any mountain-enclosed coastal valley.

Independently Variable Form Elements

Among the most obvious of the variable form elements is the height of the tankhouse. Any type may consist of two, three, or four stories, and thereby have a ground-to-roof height of between 18 and 40 feet. Most tankhouses are three stories counting the tankroom and are from 25 to 35 feet high. Taller than average tankhouses tend to correlate with larger-size tanks, larger two-story houses, a general display of wealth on the farmstead, or a relatively large-scale farm operation. On the other hand, humble two-story tankhouses frequently accompany humble one-story houses, and may indicate part-time or small-scale farming. Many exceptions occur, however, and these correlations should not be drawn too rigidly.

In contrast to height, width dimensions are more constant, varying between 9 and 14 feet; however, various appendages are frequently added to the tankhouse, such as a blacksmith shop or an extra bedroom for a hired hand or a child (Fig. 7). The rooms added occur in many sizes and shapes and were generally ignored for this study because they are not part of the tankhouse itself and there is little observable consistency in their patterns.

Roof types are another independent form trait. Any of several roof types may appear on any tankhouse type. Most predominant is the shallow pyramidal roof, though steep pyramidals are not uncommon. Departures from the dominant pyramidal, such as the gabled roof, the hipped roof, or the gambrel style, generally relate to attempts at architectural blending of the tankhouse and the adjacent house (Figs. 10, 11).

Building materials also vary independently of the tankhouse types and other form elements. Tankhouse building materials most often duplicate the material of the house and other buildings on the farmstead. Horizontal board siding is by far the most popular material for both the house and the tankhouse in all parts of the state. Some early tankhouses match the board-and-batten pattern of the barn or other outhouses (Fig. 12) while a few take on a Spanish mission-style stucco and tile roof (Fig. 13).

The vast majority of California's tankhouses are unadorned, but an occasional one stands out as distinctive, having been treated with the artistic embellishments of a local artisan carpenter or a commissioned architect. Any of the basic types may be so stylized, and essentially all highly stylized tankhouses emulate the dominant motifs of the adjacent house (Fig. 14).

Attached Tankhouses

Sometime after 1910 when gasoline and electric motors began replacing the windmill, a trend developed toward construction of the tankhouse as part of the

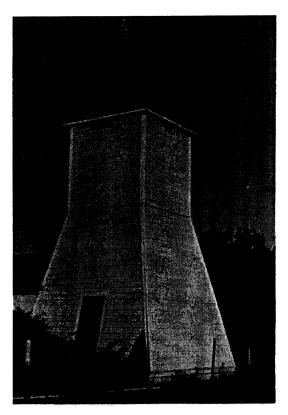
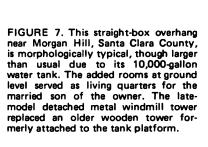
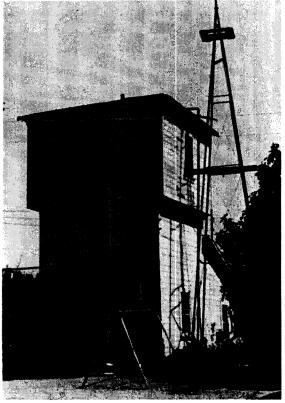


FIGURE 6. This tapered tower box on the Lincoln Ranch near Rutherford, Napa County, is built directly over a natural spring. Originally built before 1910, water was first pumped into the tank by a gasoline engine and subsequently by an electric motor still being used in 1975 to provide the water supply for the nearby ranch house. Very few elevated water tanks today are used on farms for household needs.





house. An "attached" tankhouse is most conspicuous when a tankhouse is taller than the house and has its own roof (Fig. 15), but some attached tankhouses are nearly disguised. The joining of the two houses achieves easier accessibility to the rooms in the tankhouse for they are simply incorporated as part of the house itself. The second floor is often used as a child's bedroom, while the lower room may function as a general storage area, pantry, or washroom. The room at the top continues to house the large water tank even after it is no longer used to store water. Most farmers considered the heavy wood or steel tank too much trouble to remove from a third floor walled-in room.

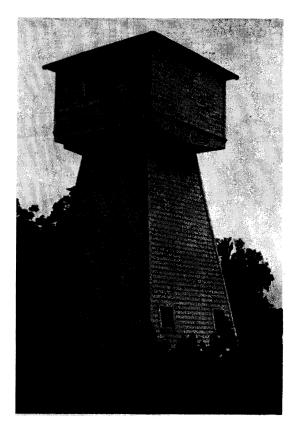


FIGURE 8. Tapered-tower overhang on the Rossi Vineyards near St. Helena, Napa County. The tower supports on this example are tapered more than is typical. It was built before 1900 and contains a 5,000-gallon redwood water tank.



FIGURE 9. Common in both the rural San Francisco Bay and Monterey Bay areas are tankhouses having partially-walled tankrooms. This example is near Gilroy, Santa Clara County.

Historical Background

California farm journals, newspapers, and local histories began illustrating tankhouses in their windmill advertisements in the 1870s. Direct evidence has not yet been found in the literature or on the landscape to indicate that tankhouses were common in the state before 1870, but it is probable that some tankhouses were built before this time for all the technological antecedents of the tankhouse existed widely in the state before 1870. For example, the availability of water tanks and the practice of placing tanks on elevated platforms are traceable to the 1850s in California. And the suction-and-force water pump

capable of elevating water above the level of the pump was also available from the 1850s.⁵ But no device was more important to the evolution of the elevated tank and tankhouse than was the American type self-regulating windmill.⁶ The windmill provided an efficient and inexpensive motive power. Farmers in Northern California used locally made windmills for irrigation in the 1850s and increasingly so in the 1860s as local mechanics patented their new improvements and as Eastern-made mills were imported.⁷

From the 1870s on the tankhouse idea was fostered by promotional efforts of the pump and windmill dealers and manufacturers. Some of the illustrated advertisements for windmills depicted only a tankhouse with no windmill, but most ads show a windmill attached to the elevated platform of an enclosed tankhouse (Fig. 16). These ads were widely circulated and can be seen in virtually every local newspaper distributed among the farmers of that period between 1870 and 1915.⁸ In addition to newspaper advertisements, the windmill manufacturers published circulars containing instruction on how to construct a windmill tower and tank tower, including specifications as to the size of the tank, the type and size of wood supports and braces used in the tank tower, and an illustration of the final product.⁹

The publishers of some of the farm journals also promoted tankhouses. They frequently included a feature article announcing a newly improved or patented windmill, sometimes with tankhouse (Fig. 16), and inviting all potential buyers to write the publishing office for more materials. ¹⁰ The publisher then distributed the circular sent him by the manufacturer.

Between 1890 and 1920, another medium was added to those disseminating the tankhouse idea, though its actual impact would be difficult to assess. The U.S. Department of Agriculture and the U.S. Geological Survey sponsored research on windmills for irrigation and domestic water needs and published the results in *The Farmer's Bulletin* and the *U.S.G.S. Water Supply Papers*. Some of these articles recommend the use of an elevated tank to accompany the windmill. ¹¹

Undoubtedly more important, however, in terms of the diffusion of the tankhouse, is simply the tendency of farmers to copy one another. This assisted the



FIGURE 10. The hipped roofs of the house and tankhouse exhibit an architectural blending on this example near Ripon, San Joaquin County. The tankhouse in this case is attached to the house and is accessible from inside the house. Attaching the tankhouse to the house became common after 1910.

FIGURE 11. In a better state of repair than typical, this tapered tower box type with its gambrel roof matches a gambrel roof on a nearby barn near Waterford, Stanislaus County. The gambrel roof is not common in California.





FIGURE 12. Board-and-batten construction, Bear Valley, Mariposa County, built about 1935 by a CCC crew. The ground floor was used as a shower room for miners.

spread of the idea and practice generally and also accounts for the subtle differences in the tankhouse types and styles in various regions of the state (Fig. 5).

The effective dispersal of the tankhouse in California took place in a natural environment which posed no serious limitations to the year-round use of the domestic pumped-gravity water supply system. Elevated tanks and tankhouses were built on farms in probably every state in America, but nowhere were they so prolific or more needed than in dry summer, mild winter climates. 12

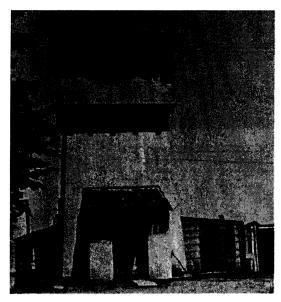


FIGURE 13. Spanish tile and stucco near Salinas, Monterey County. This large tapered tower overhang is currently being occupied as a residence for a farm labor family.

In the rainy, humid East the farmer had more alternatives for meeting his domestic water needs than was generally the case in the West. The rains took care of his crops, and his livestock were usually watered by surface streams. He had only to be concerned with his household water supply which commonly was stored in an underground cistern filled either by rainwater collected from the roof of his house, or by spring or well. Water was then pumped from the cistern into the kitchen with a hand-operated suction pump. Many of the farmers in the East who did have elevated tanks placed them in the attic of the house or in the barn loft where the tank had no effect on external architecture. Farmers in the Midwest or Northeast who utilized outdoor elevated tanks either had to insulate them from heavy frost in winter or use them only during frostfree months. 14

In California, however, the elevated tank was not in danger of damaging frost in winter, nor did the tank drip with condensation in the dry summer air, as did metal tanks in the East. ¹⁵ Further, in the West the elevated water tank served a larger need by supplying gravity-pressured water not only for the house, but also for the lawn, garden, orchard, livestock, and miscellaneous cleaning.



FIGURE 14. This tankhouse attached to a house near Modesto, Stanislaus County, has been stylized to blend architecturally with the house. Though it is octagonal in shape, it is basically a tapered-tower overhang type.



FIGURE 15. Tankhouse attached to the rear of a two-story California bungalow, Modesto, Stanislaus County.

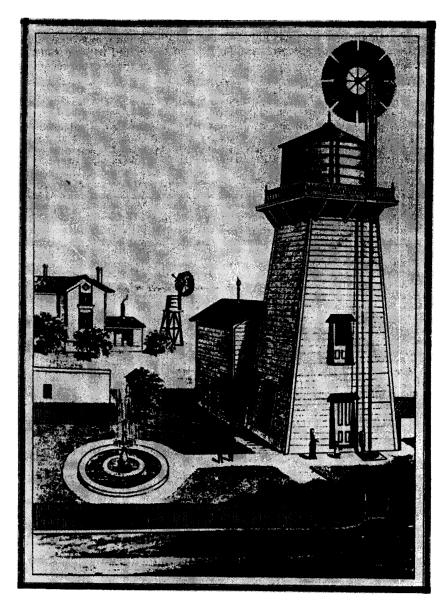
On moderate-sized farms, especially in windy areas, a 2,000-gallon tank usually sufficed, though sometimes in late summer when breezes died down, water occasionally had to be pumped by hand. After the 1890s small gasoline engines were used as a motor auxiliary to the windmill or completely replaced the windmill. Many larger farms, especially large dairies and fruit farms, required a 5,000-gallon or 10,000-gallon tank. The water level in the tank was monitored by a float device commonly consisting of corked bottles resting on the water with a string tied to them and to a heavy weight dangling on the outside of the tankhouse. As the water level dropped in the tank, and the float with it, the weight at the opposite end of the string on the outside of the tankhouse rose, and when reaching a certain point indicated that the windmill gears should again be engaged to pump more water.

Two principal factors brought about the demise of the elevated tank as a household water supply: rural electrification and the availability of hydropneumatic pressure tanks. The pressure tanks are placed on or under the ground and are operated by an electric motor which is activated automatically according to the pressure in the tank.

Very few tankhouses were built after 1935, but a large share of the old ones have remained because of the usefulness of the extra rooms under the tank. In the summer of 1975 a survey of all of the farms within a six-square mile area in northern San Joaquin Valley revealed that about 35 per cent of all older farmsteads contained a tankhouse. ¹⁶ In some cases these are in a poor state of repair. But many are freshly painted and the lower rooms are still very much in use.

Conclusion

The rural domestic tankhouse is a conspicuous though fading element in California's countryside. It is an important reminder of the past, an emblem of an important phase in the evolution of domestic water supply systems. It also reminds us of an important phase in the history of agricultural technology, that period when wind energy was effectively applied on the farm. The tankhouse and its accompanying mechanical devices played an important role in effective land settlement and occupation, and in the intensification of agriculture. Finally, the tankhouse represents a phase in domestic vernacular architecture, a phase beyond the frontier, a time when the farmer could afford to demonstrate pride in the appearance of his farmstead. In style he covered up what he considered an



NEW IMPROVED ALTHOUSE VANELESS WINDMILL, LH WOODIN. PROPRIETOR, 109 PINE ST. SAN FRANCISCO, CAL DT CURTISS AGENT, MODESTO, CAL.

FIGURE 16. In the 1870s and 1880s windmill advertisements were common in all newspapers and journals circulated among farmers in California. Most of them depict tenkhouses with windmills attached, as in the above case. *Pacific Rural Press*, March 11, 1882, front page. Also in *History of Stanislaus County, California*, Elliot and Moore, San Francisco, 1881, p. 132. (Courtesy of California State College, Stanislaus, Library.)

unsightly though useful tower and structurally incorporated it as an extension of his house. Though the tankhouse has been little noticed by the student of settlement and landscape architecture, it is worthy of this written record as it fades from the scene.

FOOTNOTES

- Farmers did not refer to their tankhouses by terms for type or shape, the terminology used in this paper to designate tankhouse types was coined by the author.
- A good example is illustrated in a leaflet on cyclone windmills published by the Pacific Manufacturing Company, San Francisco, ca. 1885, p. 5. Available in the F. Hal Higgins Library of Agricultural Technology, University of California, Davis. Other examples are illustrated in early issues of Pacific Rural Press. See, for example, the issue dated Sept. 8, 1883, p. 193.
- Essentially all small-town newspapers in California farm areas in the late nineteenthcentury contain illustrations of tankhouses. Farm journals which had broader state-wide circulation include the Pacific Rural Press, the California Farmer and Journal of Useful Sciences and the Mining and Scientific Press. All were published in San Francisco.
- Most of the evidence for this practice in the 1850s related to tanks elevated by municipalities and waterworks companies. See, for example, *History of Sacramento County, California*, Thompson and West Publishers, Oakland, 1880, p. 83. At least one early windmill manufacturer referred to the use of a tank with the windmill, in W. H. Derrick, "Windmills for the Millions," 1857 manuscript in file 767 of "Windmill History," F. Hal Higgins Library of Agricultural Technology, University of California, Davis. In the 1860s railroads in the state elevated relatively large redwood tanks at many points along their tracks.
- 5. Also called the plunger pump, or life-and-force pump, it differed from the simpler suction pump in that the force pump not only sucked water to the level of the pump but also by employing suitable valves forced the flow of water into pipes and tank above the pump. Suction-and-force pumps were especially suitable for operation by windmills. Suction-and-force pumps were exhibited in the first agricultural fair in 1852 in California and the first state fair in 1854. F. Hal Higgins, "California Pump, A World Leader," undated typewritten manuscript in File 767, "Pumps History," F. Hal Higgins Library of Agricultural Technology, University of California, Davis. See also F. Hal Higgins, "The Pump at the State Fair," Pacific Rural Press, August 28, 1937.
- For a brief historical background on the evolution of the American windmill, see Terry G. Jordan, "Evolution of the American Windmill: A Study in Diffusion and Modification," *Pioneer America*, Vol. 5, No. 2, July 1973, pp. 3-12.
- 7. Evidence indicates that self-regulating windmills were used in California by 1854 or before, and that a Californian may have invented such a mill independent of the well known Connecticut invention in 1854. See Roger S. Manning, "The Windmill in California," Journal of the West, Vol. 14, No. 3, July 1975, pp. 33-38.
- See footnote number 3.
- Circular on the cyclone windmill, Pacific Manufacturing Company, San Francisco, ca. 1885, p. 9. Available at F. Hal Higgins Library of Agricultural Technology, University of California, Davis.
- A good example is found in Pacific Rural Press, March 11, 1882, front page.
- Samples of government publications which discuss elevated tanks on farms include: Robert W. Trullinger, "Clean Water and How to Get it on the Farm," Yearbook of the U.S. Department of Agriculture, 1914, Washington, GPO, 1915, p. 149; George M. Warren, "Water Systems for the Farm Home," Farmers Bulletin, No. 941 USDA, Washington, 1918, pp. 57-60; Elmina T. Wilson, "Modern Conveniences for the Farm Home," Bulletin, No. 270, USDA, 1906, pp. 5-6; Herbert M. Wilson, "Pumping Water for Irrigation," USGS Water Supply and Irrigation Paper No. 1, 1896, serial set 3546, No. 108, p. 54.
- See Warren, ibid., pp. 56-58; and J. E. Cowper, "One Solution of the Water Supply Problem," Country Life in America, Vol. 15, April 1909, p. 642. 14.
- 15. A problem discussed by Carl A. McVey, "Water Supply for Country Homes," University of Missouri Engineering Experiment Station, Vol. 1:2. Bulletin No. 2. June 1910, p. 44.
- I conducted this survey in a six-square-mile area near Hughson, Stanislaus County, and counted all farmsteads except those which were obviously too recent to contain a tankhouse.

ATTACHMENT B:

Portion of Existing Facilities Map from Certified EIR for Las Encinas Hospital Master Plan Amendment, 2008

